Two Equivalent Ratios To 4:7.5, One With The First Term As 50 And One With The First Term Less Than 1

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Understanding ratios is fundamental in mathematics, especially when dealing with proportional relationships, scale models, and real-world applications like recipes, maps, and financial analysis. When exploring ratios, one common task is to find equivalent ratios—different ratios that express the same proportional relationship. In this article, we will delve into the concept of equivalent ratios to 4:7.5, focusing on two specific cases: one where the first term is 50, and another where the first term is less than 1. By understanding how to generate these ratios and the principles behind their equivalency, you'll enhance your ability to solve proportion problems efficiently and accurately.

Understanding Ratios and Equivalent Ratios

What Is a Ratio?

A ratio is a way to compare two quantities, indicating how many times one value contains or is contained within the other. It is expressed as a quotient or with a colon, such as a:b.

Example:
The ratio 4:7.5 compares two quantities, where for every 4 units of the first quantity, there are 7.5 units of the second.

What Are Equivalent Ratios?

Two ratios are equivalent if they represent the same proportional relationship, even if the actual numbers differ. They can be obtained by multiplying or dividing both terms of the original ratio by the same non-zero number.

Example:
Starting with 4:7.5, multiplying both terms by 2 yields 8:15, which is equivalent because:

$4 \times 2 = 8$

$7.5 \times 2 = 15$

Finding Equivalent Ratios to 4:7.5

The core process involves multiplying or dividing both terms of the ratio by the same number to generate new ratios that are equivalent.

Method 1: Using Multiplication or Division

To find equivalent ratios, select a multiplier or divisor and apply it to both terms:

- Multiplication:
Multiply both terms by the same number.

- Division:
Divide both terms by the same number (if both are divisible).

Case 1: First Term As 50

Step-by-Step Process

Given the original ratio 4:7.5, we want to find an equivalent ratio where the first term is 50.

1. Determine the Multiplier
Since the first term in the original ratio is 4, and we want it to be 50, find the factor:

$$
\text{Multiplier} = \frac{50}{4} = 12.5
$$

2. Apply the Multiplier to the Second Term
Multiply 7.5 by 12.5:

$$
7.5 \times 12.5 = 93.75
$$

3. Resulting Ratio

The equivalent ratio with the first term as 50 is:

$$
50 : 93.75
$$

Summary:
- First term: 50
- Second term: 93.75
- Equivalent ratio: 50:93.75

Key Points to Remember

- To get a specific first term, divide that term by the original first term to find the multiplier.
- Multiply the second term by the same multiplier to find the corresponding second term.

Implications and Applications

This process is useful in scaling recipes, enlarging or reducing models, or converting units while maintaining proportional relationships.

Case 2: First Term Less Than 1

Scenario Setup

Suppose we want an equivalent ratio to 4:7.5 where the first term is less than 1, such as 0.5 or 0.25.

Methodology

To find such ratios, we can:

- Divide the original ratio by a number greater than 1, which reduces both terms proportionally.

- Alternatively, multiply both terms by a fraction less than 1.

Example 1: First Term As 0.5

1. Determine the Multiplier
To find a ratio with the first term as 0.5:

\[
\text{Multiplier} = \frac{0.5}{4} = 0.125
\]

2. Find the Second Term
Multiply 7.5 by 0.125:

\[
7.5 \times 0.125 = 0.9375
\]

3. Equivalent Ratio:

\[
0.5 : 0.9375
\]

Verification:
Check whether the ratios are equivalent:

\[
\frac{4}{7.5} = \frac{0.5}{0.9375} \approx 0.5333
\]

Original ratio:

\[
4/7.5 \approx 0.5333
\]

New ratio:

\[
0.5/0.9375 \approx 0.5333
\]

Yes, they are equivalent.

Example 2: First Term As 0.25

1. Determine the Multiplier:

\[

$$
\frac{0.25}{4} = 0.0625
$$

2. Calculate the Second Term:

$$
7.5 \times 0.0625 = 0.46875
$$

3. Equivalent Ratio:

$$
0.25 : 0.46875
$$

Mathematical Principles Behind Equivalent Ratios

Scaling Ratios

The fundamental principle is that multiplying or dividing both terms of a ratio by the same non-zero number preserves the proportion. This concept is essential in various fields:

- Mathematics
- Engineering
- Science
- Economics

Fraction Representation of Ratios

Expressing ratios as fractions simplifies the process of finding equivalent ratios:

$$
\frac{a}{b} = \frac{ka}{kb}
$$

where k is any non-zero real number.

Practical Applications of Equivalent Ratios

1. Scale Models and Cartography
Creating accurate scale models involves maintaining equivalent ratios to ensure proportionality.

2. Recipes and Cooking
Adjusting ingredient quantities while keeping the same ratios ensures consistent flavor and texture.

3. Financial Ratios
Analyzing company performance often involves ratios that need to be scaled or compared across different contexts.

4. Engineering and Design
Designing components or systems often requires proportional relationships to be maintained across different sizes.

Tips for Finding Equivalent Ratios

- Always identify the original ratio and express it in fractional form for easier manipulation.
- To increase the first term to a specific value, divide that value by the original first term to get the multiplier.
- To decrease the first term to a value less than 1, divide that value by the original first term.
- Apply the same multiplier or divisor to both terms to find the equivalent ratio.

Summary and Key Takeaways

- Ratios compare two quantities and are expressed as a:b or a/b.
- Equivalent ratios represent the same proportional relationship, obtainable by multiplying or dividing both terms by the same non-zero number.
- To find a ratio with a specific first term, divide that term by the original first term to determine the multiplier.
- For a first term less than 1, divide the desired first term by the original first term.
- These concepts are widely applicable in real-world scenarios, including scaling, conversions, and problem-solving.

Conclusion

Understanding how to find and work with equivalent ratios to 4:7.5, especially when the first term is specified as 50 or less than 1, enhances mathematical literacy and problem-solving skills. Whether you're scaling a recipe, creating a model, or analyzing data, mastering the principles of proportionality ensures accuracy and consistency. Remember that the core of equivalent ratios lies in multiplying or dividing both terms by the same non-zero number, preserving the original proportion regardless of the specific values.

By practicing these techniques and understanding the underlying principles, you'll be well-equipped to handle a wide range of ratio and proportion challenges with confidence and precision.

Frequently Asked Questions

What is a ratio equivalent to 4:7.5 with the first term as 50?

To find an equivalent ratio with the first term as 50, we set up the proportion: 4/7.5 = 50/x. Cross-multiplied, 4x = 7.5 50, so x = (7.5 50) / 4 = 375 / 4 = 93.75. Therefore, the equivalent ratio is 50:93.75.

How can I find a ratio equivalent to 4:7.5 where the first term is less than 1?

Divide both terms of 4:7.5 by a common factor to get the first term less than 1. For example, dividing both by 4 gives 1:1.875. To get a term less than 1, divide further: 1/2 = 0.5 and 1.875/2 = 0.9375, resulting in 0.5:0.9375, which is equivalent to 4:7.5.

What is the general method to find an equivalent ratio when the first term is specified?

Set up a proportion with the original ratio and the desired first term, then solve for the second term. For example, if the original ratio is a:b and the new first term is c, then solve for d in c/d = a/b, giving d = (b c) / a.

Can you give an example of an equivalent ratio to

4:7.5 with a first term of 50?

Yes. As shown earlier, the equivalent ratio is 50:93.75, since (4/7.5) = (50/93.75).

What is an example of an equivalent ratio to 4:7.5 with the first term less than 1?

One example is 0.5:0.9375, obtained by dividing both terms of 4:7.5 by 8, giving 0.5 and 0.9375 respectively.

Is 50:93.75 the only ratio equivalent to 4:7.5 with the first term 50?

No, ratios can be scaled further; for example, multiplying both terms of 50:93.75 by any positive number will produce other equivalent ratios, such as 100:187.5.

How do you verify if two ratios are equivalent?

Cross-multiply the ratios and check if the products are equal. For example, for ratios a:b and c:d, they are equivalent if ad = bc.

What is the importance of understanding equivalent ratios in real-life applications?

Equivalent ratios are essential in scaling recipes, resizing images, converting units, and solving proportional problems in various fields like engineering, finance, and science.

Can ratios be equivalent if they are not in simplest form?

Yes, ratios can be equivalent regardless of whether they are simplified. Simplification makes comparison easier, but equivalence depends on the proportional relationship, not the form.

Additional Resources

Two Equivalent Ratios To 4:7.5, One With The First Term As 50 And One With The First Term Less Than 1

Understanding ratios is fundamental in mathematics, especially when dealing with comparisons, scale models, or proportions in real-life situations. When exploring ratios, a common question is how to find ratios equivalent to a given ratio, such as 4:7.5, particularly when the first term has specific conditions like being 50 or being less than 1. This article provides a comprehensive guide to identifying two equivalent ratios to 4:7.5—one where the first term is exactly 50, and another where the first term is less than 1. By understanding the principles behind ratios and proportional reasoning, you'll be able to manipulate and generate equivalent ratios confidently.

Understanding Ratios and Their Equivalence

Before diving into specific examples, it's essential to grasp what makes two ratios equivalent.

What Is a Ratio?

A ratio expresses the relative size of two quantities. It is written as a : b or as a fraction a/b, where a and b are numbers representing the quantities being compared.

When Are Ratios Equivalent?

Two ratios are equivalent if they represent the same proportional relationship, which can be verified by cross-multiplication:

- Ratios a : b and c : d are equivalent if and only if a × d = b × c.

Why Find Equivalent Ratios?

Finding equivalent ratios is useful in scaling, converting units, solving proportions, and understanding relationships between quantities.

Given Ratio: 4 : 7.5

Let's analyze the ratio 4 : 7.5 in detail.

Expressed as a Fraction

The ratio can be written as:

$$
\frac{4}{7.5}
$$

Calculating this decimal:

$$
\frac{4}{7.5} = \frac{4}{7.5} = \frac{4 \times 2}{7.5 \times 2} =
\frac{8}{15}
$$

So, 4:7.5 simplifies to 8:15.

Finding Equivalent Ratios

General Approach

To find ratios equivalent to 8:15, we multiply or divide both terms by the same number (a non-zero scalar), which preserves the ratio's value.

Key cases:

1. First term as 50
2. First term less than 1

Let's explore each case separately.

Case 1: First Term As 50

Objective

Find an equivalent ratio to 4:7.5 (or 8:15) where the first term is 50.

Solution

Since the ratio 8:15 is equivalent to 4:7.5, we can set up the proportion:

$$
\frac{8}{15} = \frac{50}{x}
$$

where x is the second term in the new ratio with the first term as 50.

Solving for x

Cross-multiplied:

$$
8 \times x = 15 \times 50
$$

$$
8x = 750
$$

$$
x = \frac{750}{8} = 93.75
$$

Result

The equivalent ratio with the first term as 50 is:

$$
\boxed{50 : 93.75}
$$

Expressed as a ratio, 50:93.75 is equivalent to 4:7.5.

Case 2: First Term Less Than 1

Objective

Find an equivalent ratio to 4:7.5, where the first term is less than 1.

Approach

Since 8:15 is the simplified form, we need to scale down the ratio to a point where the first term is less than 1.

Step 1: Use the simplified ratio

$$
8 : 15
$$

Step 2: Find a scalar to make the first term less than 1

Let k be a scalar such that:

$$
8 \times k < 1
$$

$$
k < \frac{1}{8}
$$

Any k less than 1/8 will work.

Step 3: Choose a specific value for k

Let's pick:

$$
k = \frac{1}{10}
$$

which is less than 1/8.

Step 4: Calculate the new ratio

$$
8 \times \frac{1}{10} = \frac{8}{10} = 0.8
$$

$$
15 \times \frac{1}{10} = \frac{15}{10} = 1.5
$$

Result

The ratio is:

$$
0.8 : 1.5
$$

which is equivalent to 4:7.5, but with the first term less than 1.

Summary of Results

Scenario	Ratio (original form)	Equivalent Ratio	Explanation
1	4 : 7.5	50 : 93.75	First term scaled up to 50
2	4 : 7.5	0.8 : 1.5	First term scaled down to less than 1

Additional Notes on Ratio Manipulation

How to Generate Equivalent Ratios

- Multiplying both terms by the same non-zero number.
- Dividing both terms by the same non-zero number.
- Using proportionality to solve for unknowns, especially when the first term is fixed.

Practical Applications

- Scaling recipes in cooking.
- Converting units (e.g., miles to kilometers).
- Creating scale models for architecture or engineering.
- Solving proportions in algebraic problems.

Practice Problems

1. Find an equivalent ratio to 4:7.5 where the second term is 30.
2. Find an equivalent ratio to 8:15 where the first term is 0.4.
3. If 4:7.5 is scaled so that the first term is 25, what is the second term?

Solutions:

1. $\frac{8}{15} = \frac{x}{30} \Rightarrow 8 \times 30 = 15 \times x \Rightarrow 240 = 15x \Rightarrow x=16$

2. $\frac{8}{15} = \frac{0.4}{x} \Rightarrow 8x=15 \times 0.4 \Rightarrow 8x=6 \Rightarrow x=\frac{6}{8}=0.75$

3. $\frac{8}{15} = \frac{25}{x} \Rightarrow 8x=15 \times 25 \Rightarrow 8x=375 \Rightarrow x=\frac{375}{8}=46.875$

Conclusion

Understanding how to find equivalent ratios to a given ratio like 4:7.5 under different conditions enhances your proportional reasoning skills and mathematical flexibility. Whether scaling up to a larger first term like 50 or reducing the first term to less than 1, the key principle remains: maintaining the proportional relationship by multiplying or dividing both terms by the same scalar. Mastery of these techniques is invaluable across various mathematical contexts and real-world applications, from cooking to engineering.

Remember: ratios are all about relationships. When you understand how to manipulate and scale them correctly, you unlock a powerful tool for solving countless problems efficiently and accurately.

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